What is claimed is:

1. A system comprising:

a gain medium;

a diffraction grating; and

a retroreflector,

where a distance between the gain medium and the diffraction grating is adjustable along an axis parallel to light emitted by the gain medium.

2. The system of claim 1, wherein the gain medium comprises a laser diode with an antireflective coating.

3. The system of claim 1, further comprising an actuator, the actuator being capable of adjusting the distance between the gain medium and the diffraction grating.

4. The system of claim 3, wherein the actuator comprises a piezoelectric actuator.

5. The system of claim 3, wherein the actuator comprises a voice coil actuator.

6. The system of claim 3, wherein the actuator is coupled to the gain medium.

7. The system of claim 3, wherein the actuator is coupled to the diffraction grating.

8. The system of claim 3, further comprising a detector, the detector being capable of measuring one or more wavelengths of light being emitted from the gain medium, where information from the detector is used in a closed loop feedback system to control the distance between the gain medium and the diffraction grating.

9. The system of claim 8, wherein the detector is capable of measuring phase of light being emitted from the system.

10. The system of claim 3, further comprising a detector, the detector being capable of measuring directionality of light being emitted from the gain medium, where information from the detector is used in a closed loop feedback system to control the distance between the gain medium and the diffraction grating.

11. The system of claim 10, wherein the detector comprises a quadrant cell photodetector.

12. The system of claim 10, further comprising a pick off.

13. The system of claim 1, further comprising a retroreflector actuator, the retroreflector actuator coupled to the retroreflector, the retroreflector actuator being capable of rotating the retroreflector relative to the diffraction grating.

14. The system of claim 13, wherein rotation of the retroreflector is centered about a retroreflector pivot, the pivot being positioned such that cavity length changes as the retroreflector rotates.

15. The system of claim 13, wherein rotation the retroreflector is centered about a retroreflector pivot, the pivot being positioned such that cavity length does not change as the retroreflector rotates.

16. The system of claim 13, further comprising an encoder, the encoder measuring a position of the retroreflector actuator.

17. The system of claim 16, wherein information from the encoder is used in a closed loop feedback system to control the position of the retroreflector actuator.

18. The system of claim 16, wherein information from the encoder is calibrated with respect to the distance between the gain medium and the diffraction grating.

19. The system of claim 18, wherein information from the encoder is used to control the distance between the gain medium and the diffraction grating.

20. The system of claim 13, wherein the retroreflector actuator comprises a voice coil actuator.

21. The system of claim 20, wherein the voice coil actuator comprises a rotary voice coil actuator.

22. The system of claim 20, wherein the voice coil actuator comprises a toroidal coil rotary voice coil actuator.

23. A method of controlling light output from a tunable external cavity laser comprising:

rotating a retroreflector relative to a diffraction grating to select a wavelength of light to amplify in a gain medium; and

adjusting a distance between the gain medium and the diffraction grating to control cavity length.

24. The method of claim 23, wherein rotating the retroreflector is accomplished by a retroreflector actuator.

25. The method of claim 24, wherein the retroreflector actuator comprises a voice coil actuator.

26. The method of claim 23, wherein adjusting the distance between the gain medium and the diffraction grating is accomplished by a cavity length actuator.

27. The method of claim 26, wherein the cavity length actuator comprises a piezoelectric actuator.

28. The method of claim 26, wherein the cavity length actuator comprises a voice coil actuator.

29. The method of claim 26, wherein the cavity length actuator is coupled to the gain medium.

30. The method of claim 26, wherein the cavity length actuator is coupled to the diffraction grating.

31. The method of claim 23, wherein a closed loop feedback system controls rotation the retroreflector.

32. The method of claim 23, wherein a closed loop feedback system controls cavity length.

33. A tunable external cavity laser comprising:

a gain medium, the gain medium comprising a laser diode with an antireflective coating;

a diffraction grating;

a piezoelectric cavity length actuator, the cavity length actuator being capable of adjusting a distance between the gain medium and the diffraction grating along an axis parallel to light emitted by the gain medium, the cavity length actuator coupled to the diffraction grating;

a retroreflector;

a voice coil actuator, the voice coil actuator coupled to the retroreflector, the voice coil actuator being capable of rotating the retroreflector relative to the diffraction grating;

an encoder, the encoder measuring a position of the voice coil actuator, where information from the encoder is used in a first closed loop feedback system to control the position of the retroreflector; and

a detector, the detector being capable of measuring directionality of light being emitted from the gain medium, where information from the detector is used in a second closed loop feedback system to control the distance between the gain medium and the diffraction grating.

34. A method of calibrating a tunable external cavity laser comprising:

measuring light output from the tunable external cavity laser with a detector, the detector being capable of measuring one or more wavelengths of light;

calibrating a range of motion for a retroreflector actuator of the tunable external cavity laser based on the measured light output; and

calibrating a cavity length actuator of the tunable external cavity laser with respect to a position of the retroreflector actuator based on the measured light output.

35. The method of claim 34, wherein the detector is capable of measuring phase of light.

36. The method of claim 34, wherein calibrating a range of motion for a retroreflector actuator comprises:

sweeping the retroreflector actuator through its range of motion;

measuring a light wavelength at each position of the retroreflector actuator; and

storing a retroreflector actuator position for each wavelength measured.